USER'S MANUAL

Model : CBM-202PC Series

Control LSI for Citizen Thermal Printer Mechanism

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Japan CBM Corporation
Information Systems Div.

NOTICE

1. Description in this manual are subject to changes without prior notification.
2. Upon finding of any inappropriateness, error, or omission concerning contents of this manual, please contact us at any time.
3. Notwithstanding the above Item 2, we will not be responsible for the influences of employment of this manual.

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1.OUTLINE

This LSI, through use of the Japan CBM Corp. gate array, serves to control CITIZEN line thermal printer, being featured by the following:

(1) High print quality due to a detector which detects temperature to adjust print density automatically.
(2) Both parallel and serial interfaces are available.
(3) Print density can be freely selected with the function selection terminal.
(4) Bar-code printing is available.
(5) Prints such as double width, double high and bit image printing are available by various commands.

1.1 MODEL CLASSIFICATIONS

LSI (Chip) Model name	Applied Printer Mechanism
CBM-202PC-01	LT-380
CBM-202PC-02	LT-381
CBM-202PC-03	LT-282/283

2. GENERAL SPECIFICATIONS

2.1 OUTER APPEARANCE

100-pin flat package

2.2 STRUCTURE

C-MOS LSI

2.3 DATA TRANSFER SYSTEM

Parallel transfer or serial transfer (Selectable by User)

(1) 8-bit parallel transfer
(Conforms to Centronics.)

(2) Asynchronous type serial transfer (Selectable by User)
1200, 2400, 4800, 9600, 19200 bps
Parity : odd, even, none
7 bits, 8 bits

2.4 PRINT FUNCTION

(1) No. of Print Columns and Print Speed

Machine Type	No of Digits	Total No of Dots	Character Size (mm)	Print Speed (m/s)
LT-282	37	448	1.25×3.00 (Font A) 0.88×2.13 (Font B)	50
LT-283	34	416		50
LT-380	48	576		50
LT-381	48	576		50

2.5 OPERATING VOLTAGE AND CURRENT CONSUMPTION

Voltage : DC 5V± 5%

Current consumption : Max. 80mA

2.6 OPERATING FREQUENCY

16MHz

3. HARDWARE SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	RATINGS
Supply voltage	V_{CC}	-0.3 to＋7V
Input voltage	Vi	-03 to Vcc＋0.3V
Reference supply voltage	V_{REF}	-0.3 to AVcc＋0.3V
Analog supply voltage	AV_{CC}	-0.3 to＋7V
Analog input voltage	V_{AN}	-0.3 to AVcc＋0.3V
Operating temperature	Topr	-20 to＋75℃
Storage temperature	Tstg	-55 to＋125℃

3.2 ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	MIN	MAX	UNIT	CONDITION
Input "HIGH" level	RES, STBY, NMI MDO, MD1, MD2	V_{IH}	Vcc－0.7	Vcc＋0.3	V	
	EXTAL		Vcc×0.7	Vcc＋0.3	V	
	THEM		2.0	AVcc＋0.3	V	
	Others		2.0	Vcc＋0.3	V	
Input "LOW" level	Total input terminal	V_{IL}	－0.3	0.5	V	
Output "HIGH" level	Total output terminal	V_{OH}	3.5	－	V	I_{OH}＝－1 mA
Output "LOW" level	RESO	V_{OL}	－	0.4	V	I_{OL}＝2.6 mA
	LEDER, LEDPE		－	1.0	V	I_{OL}＝10 mA
	Others			0.4	V	I_{OL}＝1.6 mA

3.3 TERMINAL PIN CONFIGURATION

PIN NO.	SIGNAL NAME	I/O	FUNCTION	LOGIC
1	VCC	—	VCC	—
2	LFSW	I	LF switch input	LOW
3	LEDER	O	Error LED output	LOW
4	LEDPE	O	Paper end LED output	LOW
5	NC	—	NC	—
6	NC	—	NC	—
7	NC	—	NC	—
8	DRQ	I	DMA request	LOW
9	NC	—	NC	—
10	RESO	O	Watchdog output	LOW
11	VSS	—	GND	—
12	DTR	O	Serial DTR (RS-232C)	HIGH
13	TXD	O	Serial TXD (RS-232C)	HIGH
14	DI	I	Print head output data	HIGH
15	RXD	I	Serial RXD (RS-232C)	HIGH
16	CP	I	Print head clock	HIGH
17	NC	—	NC	—
18	CTSW	I	Cutter switch input	LOW
19	NC	—	NC	—
20	NC	—	NC	—
21	NU	—	RESERVED	—
22	VSS	—	GND	—
23	MOTORA	O	Motor A	—
24	MOTORB	O	Motor B	—
25	MOTOR$\overline{A}$	O	Motor $\overline{A}$	—

I = Input, O = Output, I/O = Input/Output

PIN NO.	SIGNAL NAME	I/O	FUNCTION	LOGIC
26	Motor $\overline{B}$	O	Motor $\overline{B}$	—
27	D0	I/O	D0	HIGH
28	D1	I/O	D1	HIGH
29	D2	I/O	D2	HIGH
30	D3	I/O	D3	HIGH
31	D4	I/O	D4	HIGH
32	D5	I/O	D5	HIGH
33	D6	I/O	D6	HIGH
34	D7	I/O	D7	HIGH
35	VCC	—	VCC	—
36	A0	O	A0	HIGH
37	A1	O	A1	HIGH
38	A2	O	A2	HIGH
39	A3	O	A3	HIGH
40	A4	O	A4	HIGH
41	A5	O	A5	HIGH
42	A6	O	A6	HIGH
43	A7	O	A7	HIGH
44	VSS	—	GND	—
45	A8	O	A8	HIGH
46	A9	O	A9	HIGH
47	A10	O	A10	HIGH
48	A11	O	A11	HIGH
49	A12	O	A12	HIGH
50	A13	O	A13	HIGH

PIN NO.	SIGNAL NAME	I/O	FUNCTION	LOGIC
51	A14	O	A14	HIGH
52	A15	O	NC	—
53	A16	O	NC	—
54	A17	O	NC	—
55	A18	O	NC	—
56	A19	O	NC	—
57	VSS	—	GND	—
58	P60	O	NC	—
59	P61	O	NC	—
60	P62	O	NC	—
61	φ	O	Clock output	HIGH
62	STBY	I	(Pull up in VCC with 10KΩ.)	LOW
63	RES	I	Reset input	LOW
64	NMI	I	(Pull up in VCC with 10K Ω.)	LOW
65	VSS	—	GND	—
66	EXTAL	—	EXTAL (16 MHz)	—
67	XTAL	—	XTAL (16 MHz)	—
68	VCC	—	VCC	—
69	P63	O	NC	—
70	RD	O	RD	LOW
71	HRW	O	HRW	LOW
72	P66	O	NC	—
73	MD0	I	(Pull up in VCC with 10KΩ.)	HIGH
74	MD1	I	(Pull down in GND with 10KΩ.)	LOW
75	MD2	I	(Pull up in VCC with 10K Ω.)	HIGH

PIN NO.	SIGNAL NAME	I/O	FUNCTION	LOGIC
76	AVCC	—	VCC	—
77	VREF	—	VCC	—
78	THERM	I	Head temperature detection terminal	—
79	NC	I	(Pull down in GND with 10K Ω.)	—
80	NC	I	(Pull down in GND with 10K Ω.)	—
81	NC	I	(Pull down in GND with 10K Ω.)	—
82	NC	I	(Pull down in GND with 10K Ω.)	—
83	NC	I	(Pull down in GND with 10K Ω.)	—
84	NC	I	(Pull down in GND with 10K Ω.)	—
85	NC	I	(Pull down in GND with 10K Ω.)	—
86	AVSS	—	GND	—
87	STB	I	Parallel data interrupt	LOW
88	HEADUP	I	Headup detection terminal	LOW
89	CS2	O	Gate array chip selection	LOW
90	CS1	O	RAM chip selection	LOW
91	CS0	O	(Kanji ROM chip selection. Only for Japanese use.)	LOW
92	VSS	—	GND	—
93	NC	O	NC	—
94	STRB1	O	Head Strobe 1	LOW
95	STRB2	O	Head Strobe 2	LOW
96	STRB3	O	Head Strobe 3	LOW
97	INH	O	Motor control	LOW
98	LATCH	O	Head latch signal	LOW
99	PAPER	I	Paper end input	HIGH
100	DSR	I	Serial DSR (RS-232C)	HIGH

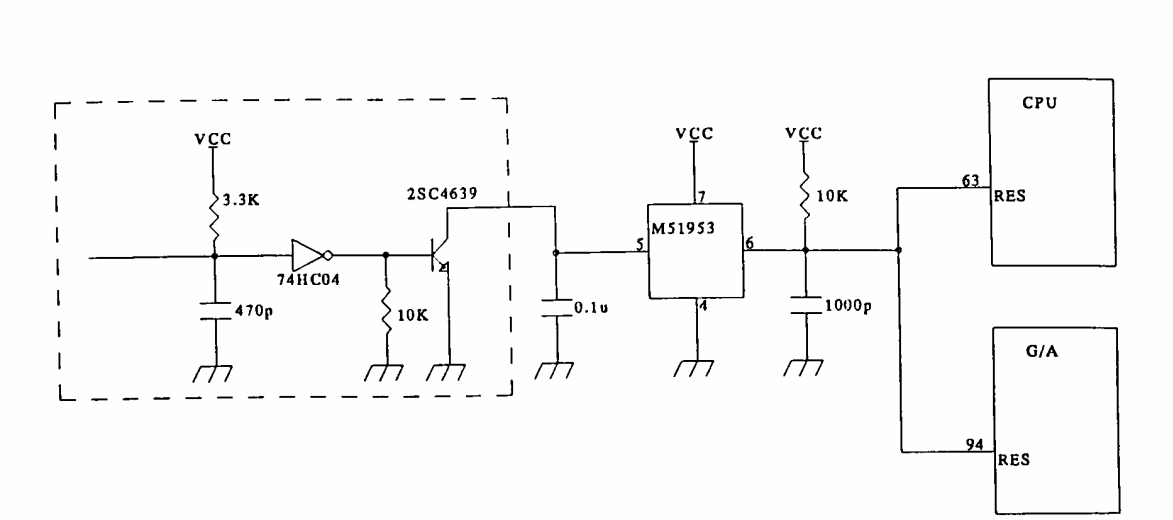
Pin Arrangement and Functions of Gate Array(CBM-202LA)

PIN NO.	SIGNAL NAME	I/O	FUNCTION	LOGIC
44	D7	I	Parallel input data D7	HIGH
45	D6	I	Parallel input data D6	HIGH
46	D5	I	Parallel input data D5	HIGH
47	D4	I	Parallel input data D4	HIGH
48	D3	I	Parallel input data D3	HIGH
49	D2	I	Parallel input data D2	HIGH
50	D1	I	Parallel input data D1	HIGH
51	D0	I	Parallel input data D0	HIGH
52	STROBE	I	Parallel STROBE	LOW
55	BUSY	O	Parallel BUSY	HIGH
58	PAO7	O	NC	—
59	ACK	O	Parallel ACK	—
61	PE	O	Parallel paper end	HIGH
62	FAULT	O	Parallel FAULT	LOW
63	CUTTERX	O	Cutter X	—
64	CUTTERY	O	Cutter Y	—
65	PAO1	O	NC	—
67	PAO0	O	NC	—

3.4 RESET CIRCUIT

With RES terminal set to "Low", reset state is created.
In order to assure resetting, it is necessary to hold "Low" for min. 20ms on supply of power and for min. 625ns while in operation.

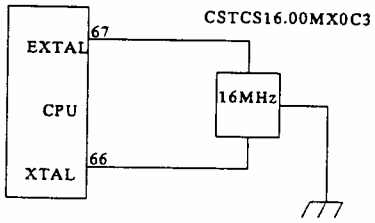
When external reset is not used, those parts inside the broken lines are not required.

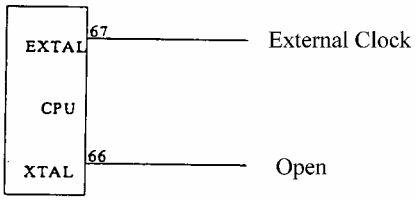


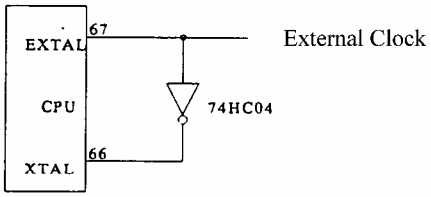
3.5 OSCILLATION CIRCUIT

A clock oscillator, being installed, generates a system clock and an internal clock. Two clock supplying methods are available including one to connect a ceramic oscillator and the other to input an external clock.

When using a ceramic oscillator, you are recommended to use CSTCS16.00MX0C3 (with a condenser) manufactured by Murata Mfg. Co.. For input of an external clock, two methods are available, one of which is to open XTAL terminal and the other of which is to input an antiphase clock in XTAL terminal.

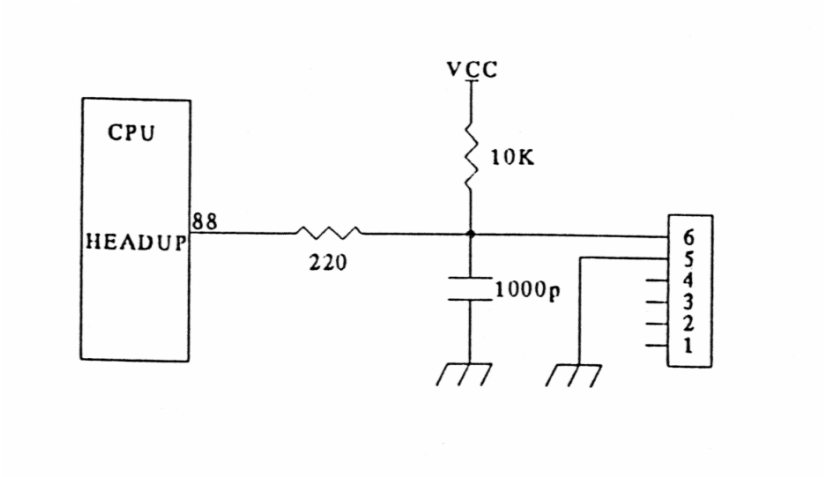






3.6 HEAD-UP DETECTION CIRCUIT

Up/down state of the head is detected so that no power is supplied in head-up state, with the head-up sensor installed in the printer. With head UP, it becomes "OPEN". With head DOWN, it becomes "CLOSE". In head UP state, CPU's HEADUP (Pin 88) gets "HIGH", where printing is immediately stopped with error output if it is while in print operation. Printing is resumed when it becomes head DOWN.

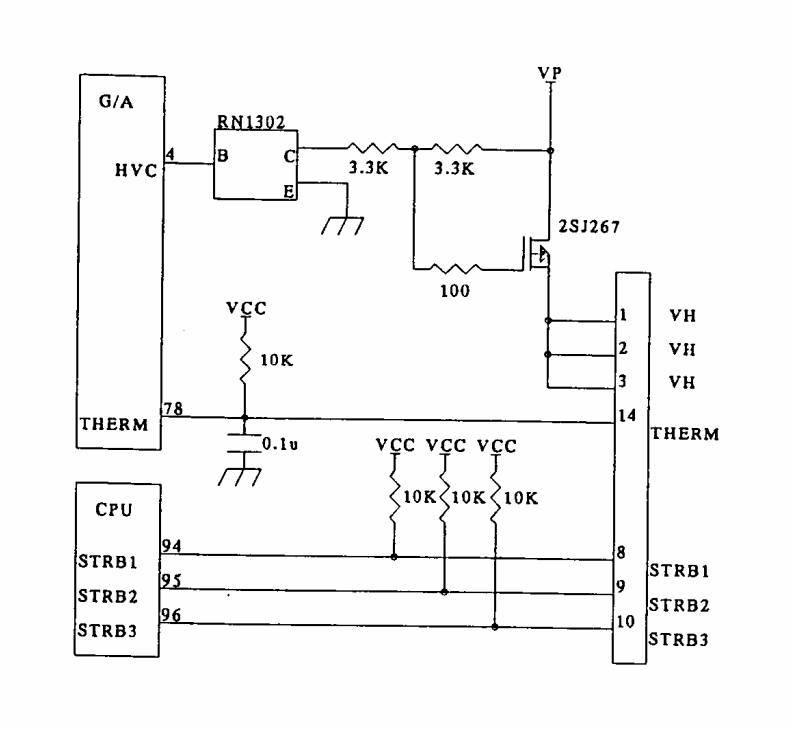


3.7 HEAD DETECTION CIRCUIT

VP is controlled so as to prevent the head from electrolytic etching.
When turning ON the VP, set 11VC (Pin 4) of the gate array (CBM-202LA)to "HIGH".
When turning it OFF, set the HVC to "LOW".

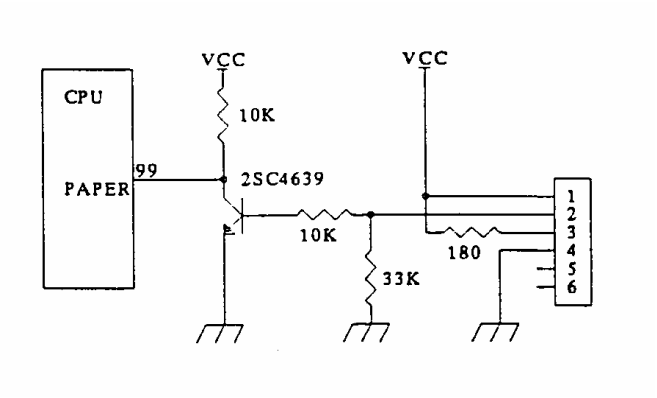
It is also provided with a temperature detection circuit which serves to prevent print quality from being deteriorated or destroyed by temperature. This function, through use of a thermistor installed in the printer, detects temperature based on which energy applied to the head is determined. Further, when head temperature has exceeded 60°C, printing is stopped so that the head is protected from being destroyed.

For protection of CPU runaway, make connection so that the gate array is reset by output of the CPU watchdog timer. The CPU itself has been set to which resetting can work. Further, to prevent the head strobe from being turned ON at that time, place a pull-up resistance in STRB1 to STRB3 each by one.



3.8 PAPER END DETECTION CIRCUIT

Existence of printing paper is detected by the paper sensor which is installed in the paper not to supply power when paper runs our.
Without printing paper, CPU PAPER (Pin 99) gets "HIGH". When this takes place while in printing operation, the operation stops at the end of the line, sending an error output. Printing is automatically resumed when paper is supplied.

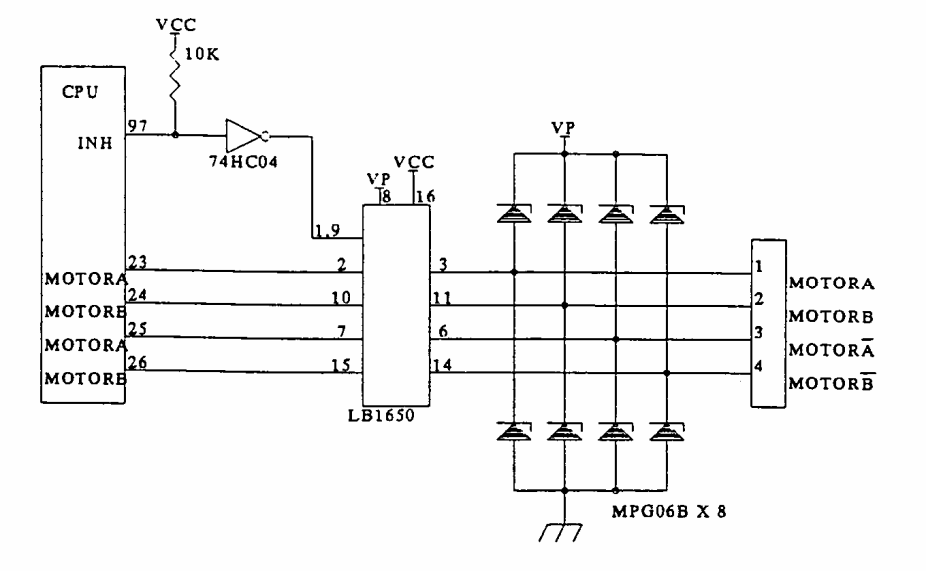


3.9 MOTOR CONTROL CIRCUIT

Except while in paper feed, the motor is held unexcited by CPU INH (Pin 97) so that heating of the motor is prevented. While INH is held in "HIGH", the motor is maintained unexcited.

On supply of power, 4 dot lines of line feed is performed to meet the motor phase.

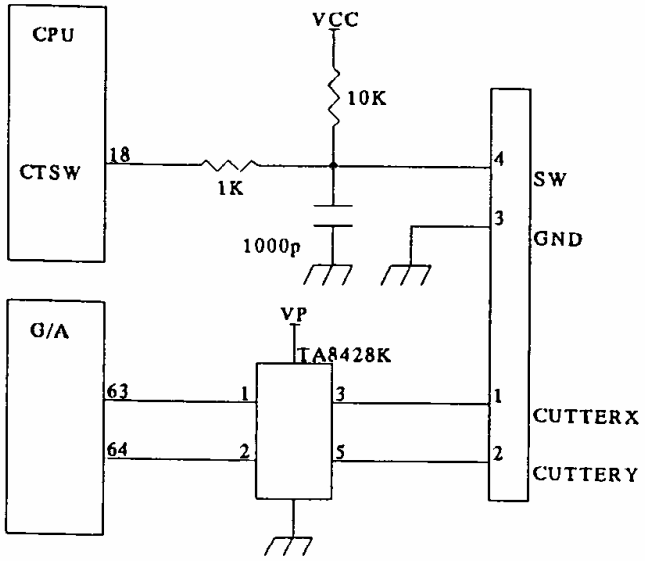
Avoid continuous printing over 15 min.



3.10 AUTO CUTTER CONTROL CIRCUIT

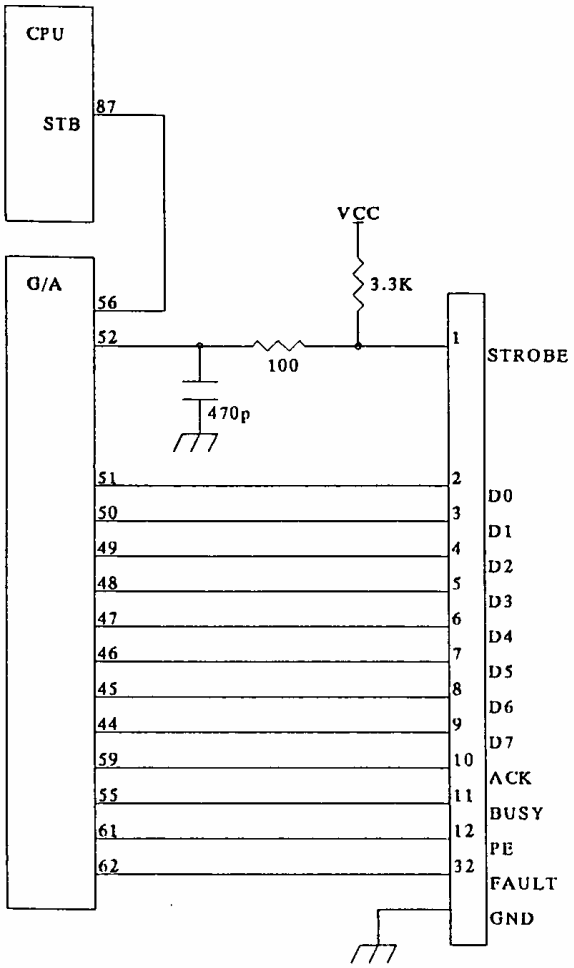
This CPU, by using the gate array (CBM-202LA), has auto cutter control function.

When an auto cutter is not used, set DS1-1 to OFF. When DS1-1 is ON, alarm state is created where normal operation is interrupted.



3.11 PARALLEL INTERFACE CIRCUIT

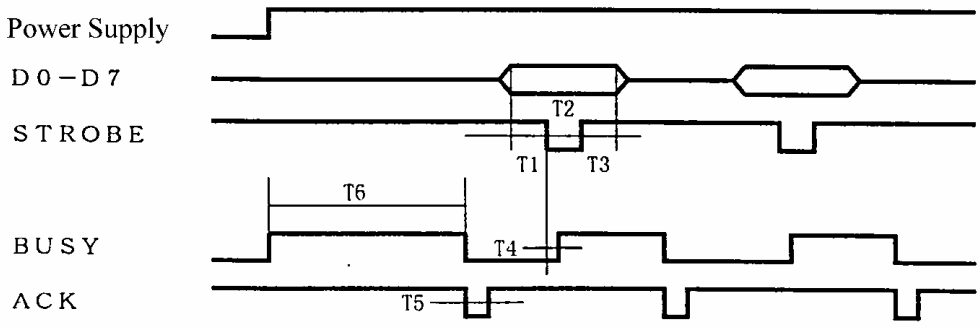
This circuit performs 8-bit parallel interface by mainly using the gate array ports. When the parallel interface is not used, pull up STB (Pin 52) of the gate array (CBM-202LA) through use of 10KΩ resistance. Also, either connect CPU's STB (Pin 87) to INTR (Pin 56) of the gate array or pull it up with 10K Ω resistance.



Gate Array Signal Names and Functions

SIGNAL NAME	PIN NO.	I/O	FUNCTION
STROBE	52	Input	The signal to read data (negative logic)
D0	51	Input	Input data (positive logic)
D1	50		
D2	49		
D3	48		
D4	47		
D5	46		
D6	45		
D7	44		
ACK	59	Output	Signal to indicate that data have been read. (negative logic)
BUSY	55	Output	Signal to indicate that data receiving is possible. (positive logic) Send data while it is in "LOW".
PE	61	Output	Signal which is output when printing paper runs out . (positive logic)
FAULT	62	Output	Signal to indicate a printer error (negative logic)
GND			

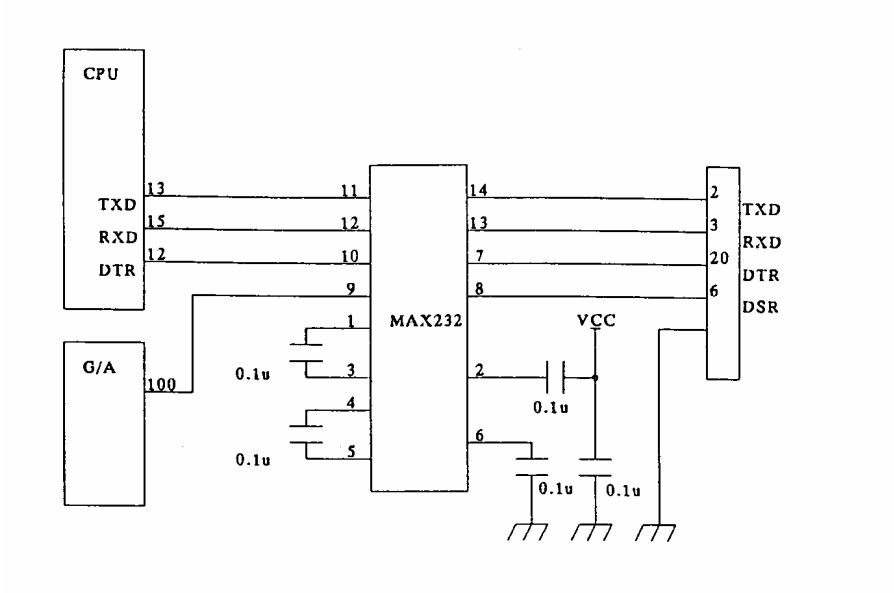
Timing Chart



T1、T2、T3：0.5μs MIN
T4　　：270ns MAX
T5　　：2.3μs TYP
T6　　：500ms MIN

3.12 SERIAL INTERFACE CIRCUIT

Serial interface applies asynchronous serial system.
When not using serial interface, pull up, CPU's RXD (Pin 15) and DSR (Pin 100) with 10K Ω resistance.

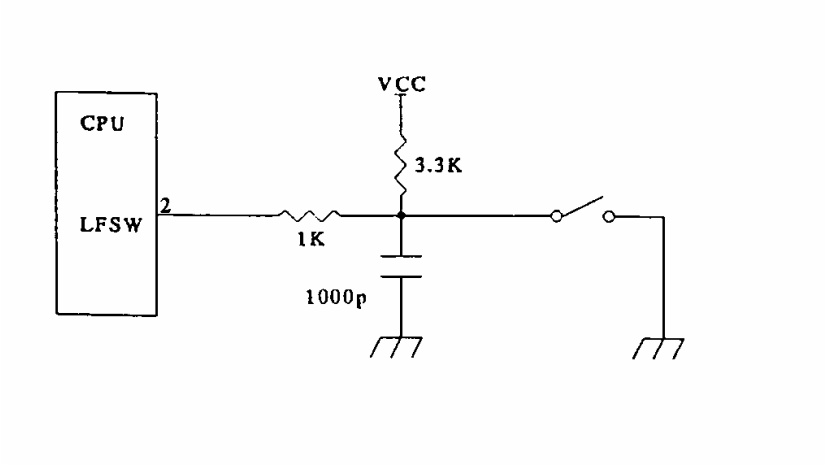


Signal Names and Functions

SIGNAL NAME	PIN NO.	I/O	FUNCTION
TXD	13	Output	Transmits status. When data receiving is not available while in XON/XOFF, XOFF (13H) is transmitted. When receiving is made possible, XON (11H) is transmitted.
RXD	15	Input	Receiving data signal. On occurrence of a framing error or parity error, the data are printed in "?".
DSR	100	Input	With this signal held in "LOW" when data are transmitted from CPU while DTR/DSR has been selected, transmitting takes place. With this signal held in "HIGH", transmitting is does not take place until it gets "LOW".
DTR	12	Output	Transmits data while this signal is held in "LOW". If writing takes place while in "HIGH", overrun error is created, where data are ignored.

3.13 SWITCH CIRCUIT

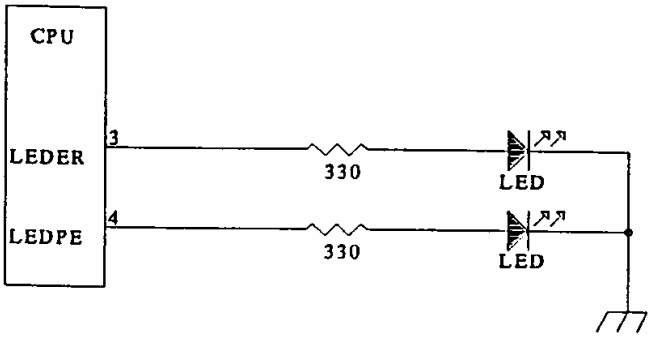
This circuit is provided with switch input function for printer paper feeding.
Also, a function for self printing is equipped through use of this switch. (Either supply power as pushing this switch or apply resetting in power supplied state as pushing this switch. Self printing starts automatically and, on completion of printing, normal standby state is recovered.)



3.14 ERROR OUTPUT CIRCUIT

Two kinds of error output are held for output of various errors. (Max. 10mA current can be taken for display with mainly LED, etc.. When this level is exceeded, however, CPU may be destroyed. Pay attention, therefore, to select an appropriate current control resistance, LED, etc..)
CPU's LEDPE (Pin 4) is exclusively for output of paper error. When printing paper has got scarce, "LOW" is output automatically. When paper is supplied, it becomes "HIGH".
CPU's LEDER (Pin 3) output various other errors in the following patterns:

ERROR	DISPLAY PATTERN	RECOVERY
Head UP		Head DOWN
Memory check		Not available
Head overheat		Head temperature lowered
Macro execution standby		LF switch
Cutter motor lock		Paper jamming cancelled



3.15 FUNCTION SELECTION CIRCUIT

The gate array input ports have terminals for function selection. To connect a DIP switch, etc., do it as it is. When fixing with a jumper, etc., connect to GND only for those to be set to "LOW".

GATE ARRAY		FUNCTION	"LOW"	"HIGH"
PIN NO.	SIGNAL NAME			
33	PAI0	Auto cutter	Equipped	None
32	PAI1	CR Selection	LF	Ignored
31	PAI2	Print density	See Table③	
30	PAI3	DTR/XON-XOFF	XON-XOFF	DTR/DSR
29	PAI4	Interface	See Table①	
28	PAI5			
27	PAI6			
26	PAI7			

PAI 3 is valid only when serial interface is used.

GATE ARRAY		FUNCTION	"LOW"	"HIGH"
PIN NO.	SIGNAL NAME			
43	PBI0	Selection of international character	See Table②	
42	PBI1			
39	PBI2			
38	PBI3	Auto loading	Valid	Invalid
37	PBI4	Input buffer	4K bytes	72 bytes
36	PBI5	Print density	See Table③	
35	PBI6	Bit length	8 bits	7 bits
34	PBI7	Type of printer mechanism	LT-282	LT-283

PBI6 is valid only when serial interface is used.

①Interface

INPUT SYSTEM	PARITY	BAUD RATE	PAI7	PAI6	PAI5	PAI4
Parallel	—	—	HIGH	HIGH	HIGH	HIGH
Serial	None	1200	HIGH	HIGH	HIGH	LOW
		2400	HIGH	HIGH	LOW	HIGH
		4800	HIGH	HIGH	LOW	LOW
		9600	HIGH	LOW	HIGH	HIGH
		19200	HIGH	LOW	HIGH	LOW
	Odd	1200	HIGH	LOW	LOW	HIGH
		2400	HIGH	LOW	LOW	LOW
		4800	LOW	HIGH	HIGH	HIGH
		9600	LOW	HIGH	HIGH	LOW
		19200	LOW	HIGH	LOW	HIGH
	Even	1200	LOW	HIGH	LOW	LOW
		2400	LOW	LOW	HIGH	HIGH
		4800	LOW	LOW	HIGH	LOW
		9600	LOW	LOW	LOW	HIGH
		19200	LOW	LOW	LOW	LOW

②International Characters

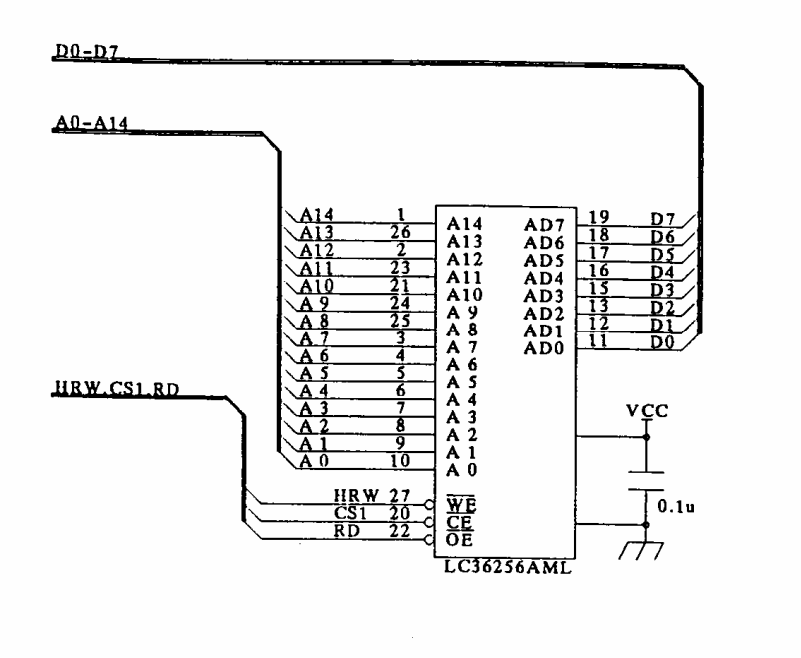
International Characters	PBI2	PBI1	PBI0
Japan (JIS)	HIGH	HIGH	HIGH
Japan (Shift JIS)	HIGH	HIGH	LOW
Sweden	HIGH	LOW	HIGH
Denmark I	HIGH	LOW	LOW
U.K.	LOW	HIGH	HIGH
Germany	LOW	HIGH	LOW
France	LOW	LOW	HIGH
U.S.A.	LOW	LOW	LOW

③Print Density

Print Density	PAI 2	PAI 1
Light	HIGH	HIGH
Standard	HIGH	LOW
Dark	LOW	HIGH
Darker	LOW	LOW

3.16 EXTERNAL RAM INTERFACE

An external SRAM of 32 K bytes is always necessary for printing. When no external RAM is connected, normal operation cannot be obtained.

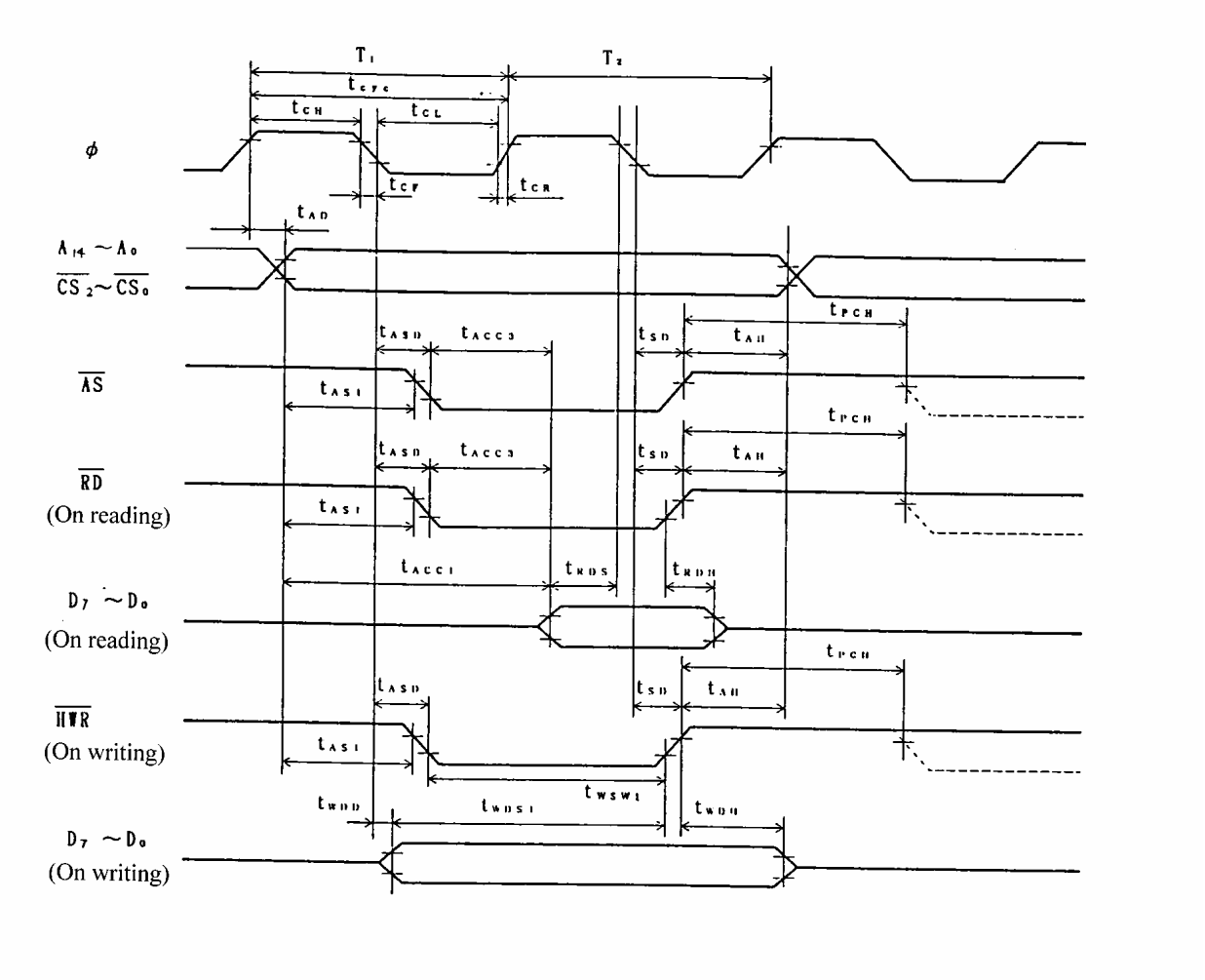


Bus Timing

VCC＝5.0V±10%, AVCC＝5.0V±10%, VF＝4.5V～AVCC,
VSS＝AVSS＝0V, φ2～16MHz, TA＝－20～＋75℃

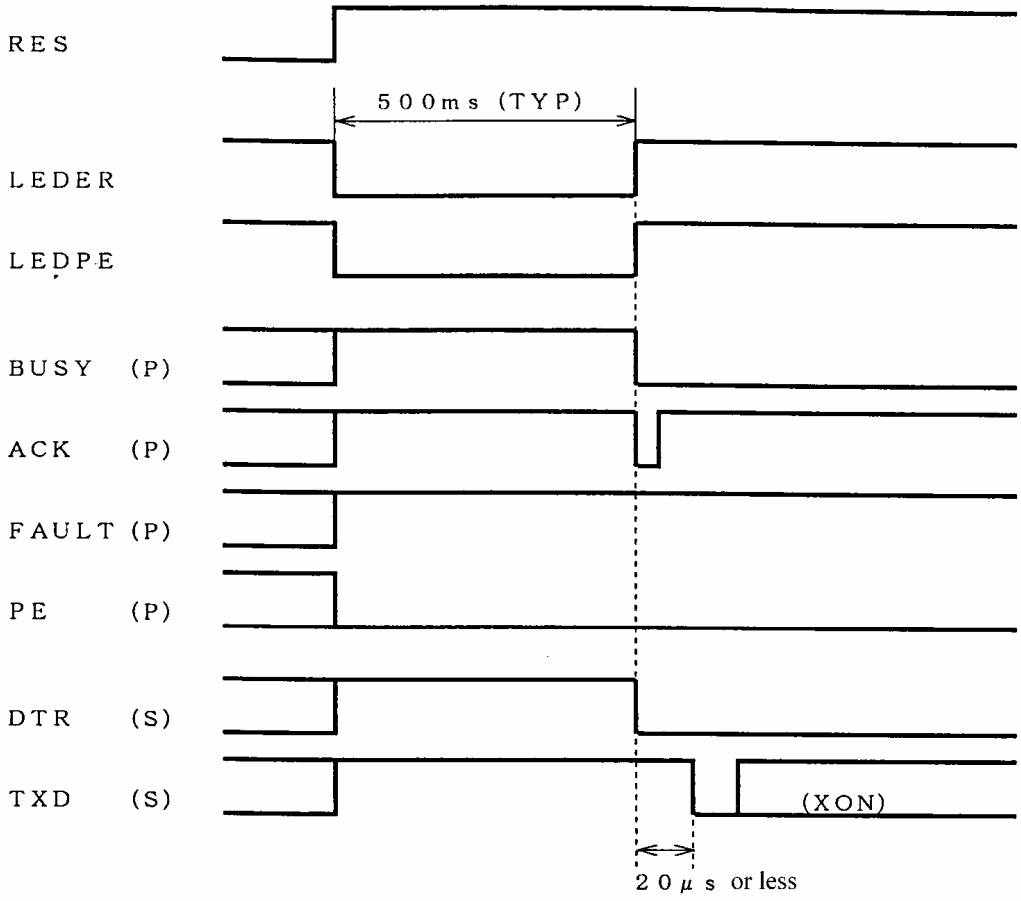
ITEM	SYMBOL	MIN	MAX
Clock cycle time	tcyc	62.5	500
Clock pulse width "LOW" level time	t_{CL}	20	－
Clock pulse width "HIGH" level time	t_{CH}	20	－
Clock rise time	t_{CR}	－	10
Clock breaking time	t_{CF}	－	10
Address delay time	t_{AD}	－	30
Address hold time	t_{AH}	10	－
Address strobe delay time	t_{ASD}	－	30
Write strobe delay time	t_{WSD}	－	30
Strobe delay time	t_{SD}	－	30
Write data strobe pulse width 1	t_{WSW1}	35	－
Write data strobe pulse width 2	t_{WSW2}	65	－
Address setup time 1	t_{AS1}	10	－
Address setup time 2	t_{AS2}	40	－
Read data setup time	t_{RDS}	20	－
Read data hold time	t_{RDH}	0	－
Write data delay time	t_{WDD}	－	60
Write data setup time 1	t_{WDS1}	35	－
Write data setup time 2	t_{WDS2}	5	－
Write data hold time	t_{WDH}	20	－
Read data access time 1	t_{ACC1}	－	55
Read data access time 2	t_{ACC2}	－	115

Unit: ns

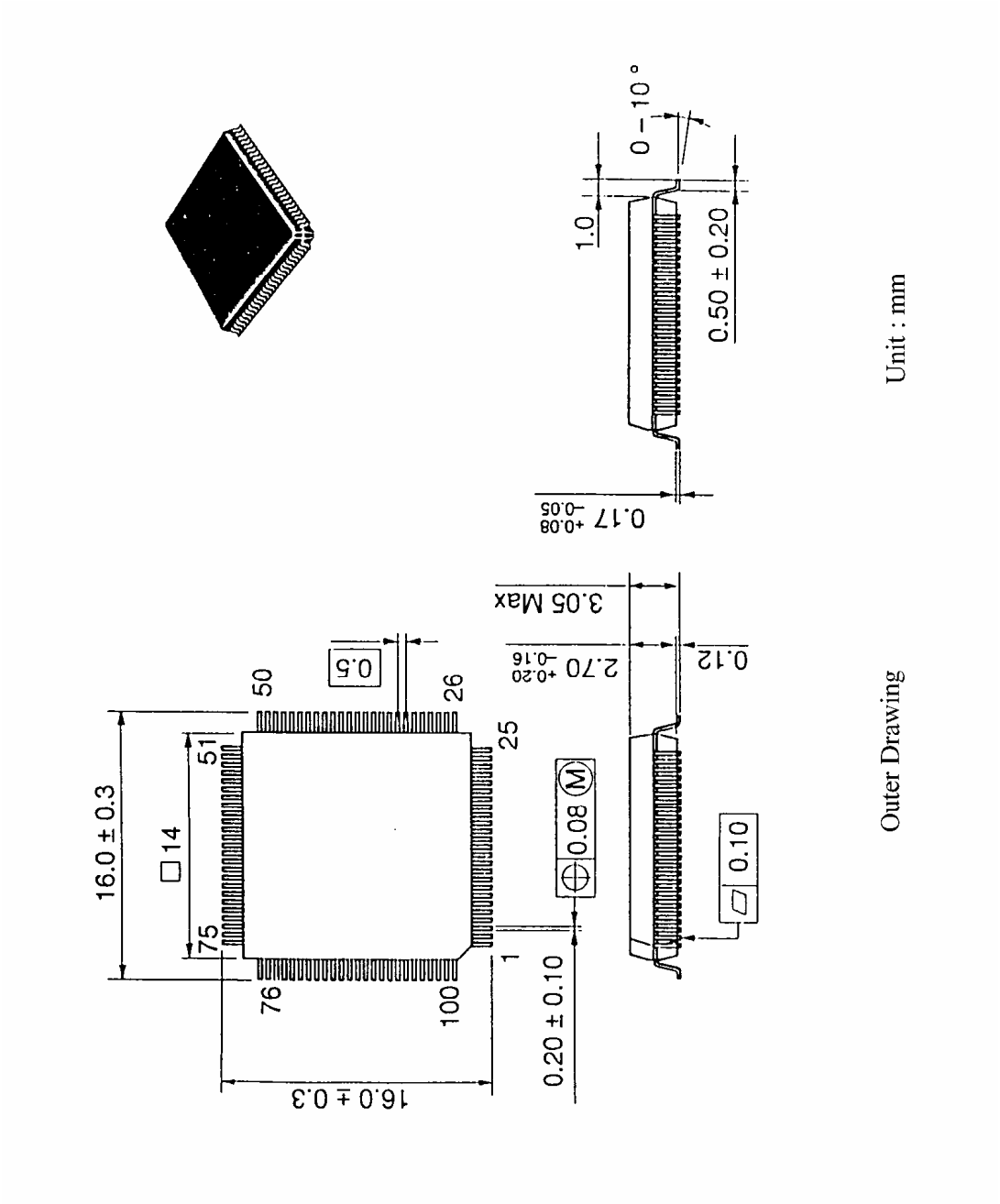

T1
T2
tcyc
tCH
tCL
φ
tCF
tCR
tAD
A14 ~ A0
CS2~CS0
tASD
tACC3
tSD
tAH
tPCH
AS
tAS1
RD
(On reading)
tACC1
tRDS
tRDH
D7 ~D0
(On reading)
HWR
(On writing)
tWSW1
tWDD
tWDS1
tWDH
D7 ~D0
(On writing)

4. OPERATING TIMING

Operating timing after resetting is canceled for this CPU is shown below:



5. PACKAGE SPECIFICATIONS



6. SPECIAL REMARKS FOR MOUNTING

6.1 CAUTIONS

As relative humidity gets low, static electricity tends to be charged. Although surface mount type packages need to be stored in dry environments not to be affected by humidity, there is no worry for charging as the packages in storage are not subject to friction. However, during handling and mounting to substrates where friction and electric discharge are likely to take place, the relative humidity is recommended to be 45 to 75% for prevention of electric charge.

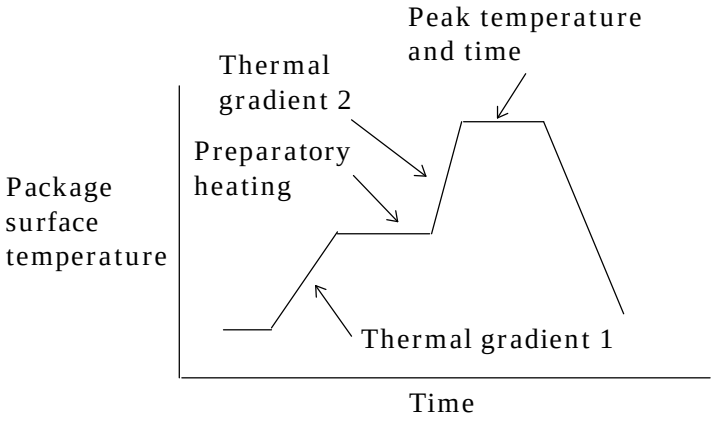
6.2 REFLOW MOUNTING

The pattern on a PCB board has been formed to facilitate soldering with the package lead pins, where a fixed amount of soldering paste is applied by screen process printing and the package is mounted. The package is temporarily fixed by surface tension of soldering paste.
Then, with solder being reflowed, the package lead and the pattern on the base board are fitted by surface tension of the reflowed solder.
Although the design value of the lead joint part pattern on a PCB board varies by soldering paste material, reflow conditions, etc., the standard level is 1.1 to 1.3 times of the width of a lead pin subject to soldering.

6.3 RECOMMENDED CONDITIONS FOR VARIOUS MOUNTING METHODS

Mounting methods most commonly applied to surface mounting devices are the infrared rays reflow method, the vapor phase reflow method, and the flow soldering method.
In all of these mounting methods, as the entire part of a package is heated, strong thermal stress is applied to the package. For reliability assurance sake, therefore, not only temperature of the solder joint part but also temperature of the package surface need to be controlled. As the recommended mounting conditions, use package surface temperature for the reflow method and solder temperature as well as dipping time for the flow soldering method.
The basic understanding of the recommended conditions is explained in Fig. 6.1:

Fig. 6.1



1) Thermal Gradient 1
On a sudden temperature increase, unevenness in temperature is produced among package parts of a surface mounting device, where difference in thermal expansion coefficients of materials can cause a warp in the package, resulting in damaged chips. Attention, therefore, should be paid to the upper limit for the increase speed. The lower limit is based on operation efficiency of the reflow device.
2) Preparatory Heating
The parts and base boards are prepared at a temperature below the solder melting temperature so that solder jointing is stabilized and thermal shock is lessened. In general, the temperature is set to a level close to the rated temperature of the surface mounting device.
3) Thermal Gradient 2
The upper limit of increase temperature, as in 1), is determined based on necessity to maintain the peak temperature and time within the specific range.
4) Peak Temperature and Time
The greatest care must be taken to minimize damage of a package. As a peak temperature directly influences to reduce package strength and steam pressure inside a package, temperature should be held low. Also, as steam pressure rises as time passes, set time as short as possible. Conditions shown here indicate, not in mean values but in the maximum values, the points at which both the above allowable region and the solder available region are satisfied. On setting conditions, therefore, be careful not to exceed the upper limit values.
The recommended conditions for the various mounting methods are shown in Figs. 6.2 and 6.3:

Fig. 6.2 Recommended Conditions for Infrared Rays Reflow and Air Reflow

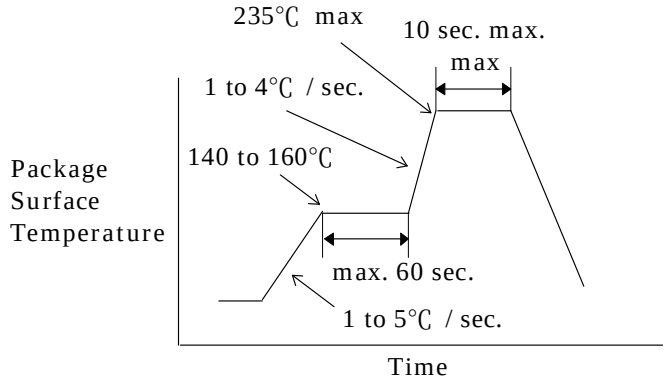
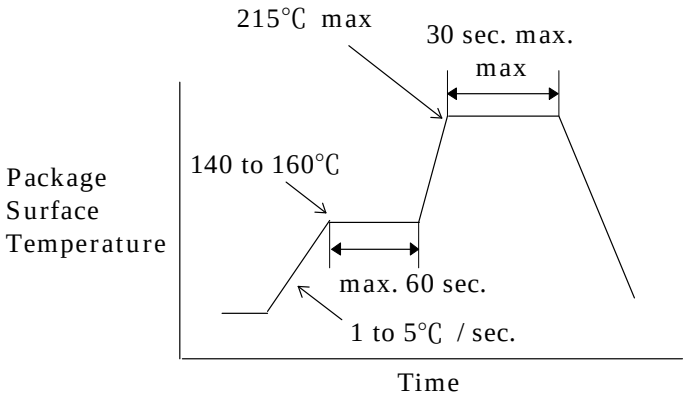


Fig. 6.3 Recommended Conditions for Vapor Phase Reflow



6.4 CLEANING METHOD

As flux residue from soldering adversely affects reliability of parts and base PCB, it should be normally removed by cleaning.

Ultrasonic cleaning, for example, is performed in the following conditions, for which cares should be taken to an applied frequency, electricity (especially, peak power), time and device resonance to prevent the device from breakage:

Frequency	..... 28 to 29KHz (Device should not resonate.)
Ultrasonic output	..... 15W/1 (1 time)
Time	..... 30 seconds and less
Others	..... Neither a device nor a PCB board directly touches an oscillation source.

6.5 STORAGE METHOD

Epoxy resin used in plastic packages, when stored in a humid place, cannot escape from moisture absorption. Absorbed moisture content, as it gets high, can suddenly vaporize on soldering implementation, causing peeling of resin/lead frame joint or even causing a crack on a package. It is, therefore, important to store it in dry environment (under normal temperature and humidity within 5 to 35 ℃and 45 to 75%RH) in dampproof package. After opening the package, please keep it in the specified environments to avoid development of moisture absorption and perform reflow implementation in the shortest possible time. When restoring it in the dampproof package, place new silica gel.
To remove water content having been absorbed during transport, storage, and handling, drying (at 125 ℃) for 16 to 24 hours is recommended to be performed.
Store external terminals as they are not yet subject to machining.
This is to prevent soldering failure from taking place on implementation caused by produced rust, etc..

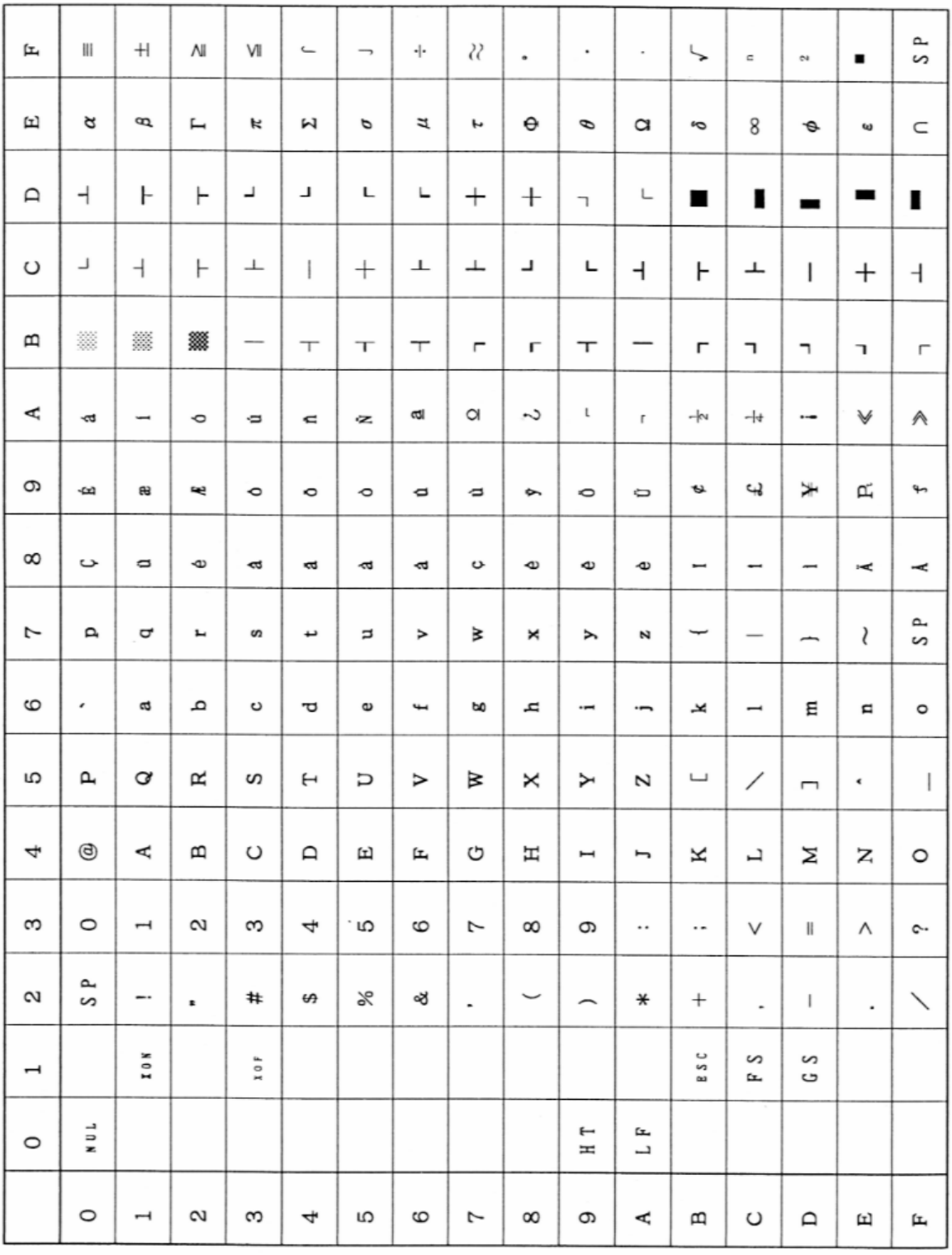
7. COMMAND LIST

	CONTROL CODE	FUNCTION	CODE
1	HT	Horizontal tab command	09H
2	CR	Print command	0DH
3	LF	Printing and paper feed	0DH
4	ESC SP	Setting the right space amount of the character	1BH 20H n
5	!	Collective specifying printing mode	1BH21H n
6	%	Specifying/canceling download character set	1BH25Hn
7	&	Defining download characters	1BH26H5nm [ap1p2...p5xa]m-n+1
8	*	Specifying the bit image mode	1BH2Amn1n2[d]k
9	-	Specifying/canceling underline	1BH2DH n
10	2	Specifying 1/6-inch line feed rate	1BH32H
11	3	Setting line feed rate of minimum pitch	1BH33Hn
12	@	Initializing the Printer	1BH40H
13	D	Setting horizontal tab position	1BH44H[n]k00H
14	E	Specifying/canceling highlighting	1BH45Hn
15	G	Specifying/canceling double printing	1BH47Hn
16	J	Printing and feeding paper n/203 inch	1BH4An
17	R	Selecting the international characters	1BH52Hn
18	c3	NOP	1BH63H33Hn
19	c4	NOP	1BH63H34Hn
20	c5	Enabling/disabling the panel switches	1BH63H35Hn
21	d	Printing and feeding the paper by n lines	1BH64Hn
22	p	NOP	1BH70Hmn1n2
23	t	Selecting the character code table	1BH74Hn
24	v	Transmitting the printer status (Serial type)	1BH75Hn
25	u	NOP	1BH76H
26	{	Specifying/canceling the inverted characters	1BH7BHn
27	V	Specifying/canceling the 90 ° - right-turned	1BH56Hn
28	$	Specifying the absolute positions	1BH24Hn1n2
29	¥	Specifying the relative positions	1BH5Cn1n2
30	GS k	Printing the bar code	1DH6BHn["d"]k00H

31	w	Selecting the horizontal size (scale factor) of bar code	1DH77n
32	h	Selecting the height of the bar code	1DH68Hn
33	H	Selecting of print position of HRI code	1DH48Hn
34	f	Selecting the font of HRI code	1DH66Hn
35	*	Defining the download bit image	1DH2An1n2[d]n1xn2x
36	/	Printing the download bit image	1DH2FHm
37	:	Starting/ending macro definition	1DH3AH
38	^	Executing the macro	1DH5En1n2n3
39	ESC =	Data input control	1BH3DHn
40	a	Aligning the characters	1BH61Hn
41	i	Activating auto cutter (Full cut)	1BH69H
42	m	Activating auto cutter (Partial cut)	1BH6DH

8. CHARACTER CODE TABLE

8.1 INTERNATIONAL



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	Ç	É	á	▒	└	┴	α	≡
1		ION	!	1	A	Q	a	q	ü	æ	í	▒	┴	┬	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	├	Γ	≥
3		IOF	#	3	C	S	c	s	â	ô	ú	│	├	└	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	┼	─	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	┤	├	┌	σ	⌡
6			&	6	F	V	f	v	å	û	ª	┤	├	┌	μ	÷
7			'	7	G	W	g	w	ç	ù	º	┐	┬	┼	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	┐	└	┼	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	┤	┌	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	│	┴	┌	Ω	·
B		ESC	+	;	K	[	k	{	ï	¢	½	┐	┬	■	δ	√
C		FS	,	<	L	\	l	|	î	£	¼	┘	├	■	∞	ⁿ
D		GS	-	=	M	]	m	}	ì	¥	¡	┘	─	■	φ	²
E			.	>	N	^	n	~	Ä	₧	«	┘	┼	■	ε	■
F			/	?	O	_	o	SP	Å	ƒ	»	┐	┴	■	∩	SP

8.2 INTERNATIONAL CHARACTER CODE TABLE

	国 名	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	U.S.A.	#	$	@	[	\	]	^	`	{	|	}	~
1	FRANCE	#	$	à	°	Ç	§	^	`	é	u	è	¨
2	GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	U.K.	£	$	@	[	\	]	^	`	{	|	}	~
4	DENMARK I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	ITALY	#	$	@	°	\	é	^	ù	à	ò	è	ì
7	SPAIN	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	JAPAN	#	$	@	[	¥	]	^	`	{	|	}	~
9	NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	DENMARK II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü